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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/616,817	07/10/2003	Bong Cheon Kim	CU-3285 RJS	2259
26530	7590	08/18/2004	EXAMINER	
LADAS & PARRY 224 SOUTH MICHIGAN AVENUE, SUITE 1200 CHICAGO, IL 60604			ISAAC, STANETTA D	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 08/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/616,817

Applicant(s)

KIM, BONG CHEON

Examiner

Stanetta D. Isaac

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 July 2003.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-6 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.


**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 10 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

  
**LYNNE A. GURLEY**  
**PRIMARY PATENT EXAMINER**  
**TC 2800, AU 2812**

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 8/4/04.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

This Office Action is in response to the application filed on 7/10/03. Currently, claims 1-6 are pending.

#### ***Information Disclosure Statement***

The information disclosure statement (IDS) was submitted on 8/15/03. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

#### ***Drawings***

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: reference number 27 in figure 2D.

The drawings are objected to under 37 CFR 1.83(a) because they fail to show the pad oxide film and pad nitride film under reference numerals 2 and 3, respectively, as described in the specification.

Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several

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views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### *Specification*

The abstract of the disclosure is objected to because it contains too many words. See MPEP § 608.01(f). The abstract should be a brief narrative of the disclosure as a whole in a single paragraph of 150 words or less commencing on a separate sheet following the claims. Correction is required. See MPEP § 608.01(b). Appropriate correction is required.

The disclosure is objected to because of the following informalities: page 9, lines 14-15, the examiner requests clarification with regards to, as stated, "the pad oxide film is overly polished such that the poly-silicon film, which was used as the etch stopper layer in the reverse etching, is completely removed. According to the figure 2D, and claim 5, the pad nitride film is overly polished such that the poly-silicon film is completely removed. Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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Claims 1-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is indefinite whether the “reverse mask”, in claim 1, is an etch barrier. As stated on pages 8, lines 15-24, and page 9, lines 1-5, the “poly-silicon layer” is the etch barrier. For examination purposes, the “poly-silicon layer” is considered to be the etch barrier.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al. US Patent 6,015,757 in view of Kim et al. US Patent 6,071,792.

Tsai teaches the semiconductor substantially as claimed. See figures 1-8, and corresponding text, pertaining to claim 1, where Tsai teaches a method for forming an isolation film in a silicon substrate, which comprises the steps of: successively depositing a pad oxide film **24**, a pad nitride film **26**, and a poly-silicon film **28** on a silicon substrate **20** (figure 4); patterning the poly-silicon film, the pad nitride film and the pad oxide film to expose a portion of the substrate which correspond to field region of the substrate (figure 5; col. 3, lines 24-49); etching the exposed portion of the substrate to form a trench **30** (figure 5; col. 3, lines 24-49); depositing an HDP-oxide film **32** (col. 3, lines 50-65; col. 4, lines 21-27, a plasma enhanced oxide, a SACVD oxide, or an ozone-TEOS

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layer which is densified) on the resulting substrate to the same thickness as the sum of the thickness of the deposited films and the depth of the trench in such a manner as to fill the trench; etching an exposed portion of the HDP-oxide film on the active region using the poly-silicon layer as an etch barrier (figures 7-8; col. 4, lines 1-20); subjecting the HDP-oxide film and the poly-silicon film to a chemical mechanical polishing (CMP) (figure 8; col. 4, lines 13-20); and removing the pad nitride film (col. 4, lines 18-20). In addition, Tsai teaches, pertaining to claim 4, the method wherein the step of etching a portion of the HDP-oxide film formed on the active region is carried using the poly-silicon film as an etch stopper, at a high etch selectivity (col. 4, lines 1-20); Tsai also teaches, pertaining to claim 5, subjecting the HDP-oxide film and the poly-silicon film to CMP in such a manner that the surface of the pad nitride film is removed to a thickness of about 100-200 Å after the poly-silicon film was completely removed. Since the pad nitride is removed after the poly-silicon is removed, the claimed removal thickness is accomplished after a length of time during the CMP performed removal step (figure 8; col. 4, lines 13-20). Finally, Tsai teaches, pertaining to claim 6, the method wherein the step of removing the pad nitride film is carried out using a mixed solution of nitric acid ( $\text{HNO}_3$ ) and phosphoric acid ( $\text{H}_3\text{PO}_4$ ) (col. 4, lines 18-20).

However, Tsai fails to show, pertaining to claim 1, forming a reverse mask on the HDP-oxide film, which covers the field region and a portion of an active region, which is adjacent to the field region and extends inward from the edge of the active region by a given distance and, removing the reverse mask. Tsai also fails to show, pertaining to claim 2, the method wherein the reverse mask is formed in such a manner as to cover the field region and a portion of the active region which is adjacent to the field region and

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extends inward from the edge of the active region by a distance 0.04-.05  $\mu\text{m}$ . Finally, Tsai fails to show, pertaining to claim 3, the method wherein the step of etching a portion of the HDP-oxide film formed on the active region is carried out using at least one gas selected from the group consisting of  $\text{C}_x\text{F}_y$ ,  $\text{O}_2$ , Ar, and  $\text{CH}_x\text{F}_y$ . Tsai also fails to show, pertaining to claim 4, an etch selectivity of the oxide film to the poly-silicon film greater than 100:1.

Kim teaches in figures 1-10, and corresponding text, in a similar semiconductor method, including a trench isolation technique, pertaining to claims 1 and 2, forming a reverse mask 116 on the HDP-oxide film 114 (figures 5-7), which covers the field region and a portion of an active region, which is adjacent to the field region and extends inward from the edge of the active region by a given distance of 0.04-0.05  $\mu\text{m}$  (116 covers entire active region and field region) and, removing the reverse mask (col. 3, lines 22-61, figure 8). Kim also teaches, pertaining to claim 3, the method wherein the step of etching a portion of the HDP-oxide film formed on the active region is carried out using at least one gas selected from the group consisting of  $\text{C}_x\text{F}_y$ ,  $\text{O}_2$ , Ar, and  $\text{CH}_x\text{F}_y$  (Ar, plasma col. 3, lines 30-35; col. 4, lines 9-17).

It would have been obvious to one of ordinary skill in the art to incorporate, forming a reverse mask on the HDP-oxide film, which covers the field region and a portion of an active region, which is adjacent to the field region and extends inward from the edge of the active region, by a given distance 0.04-0.05  $\mu\text{m}$  and, to have subsequently removed the reverse mask, in the method of Tsai, pertaining to claims 1 and 2, according to the teachings of Kim, with the motivation that, as stated in Kim, col. 1 lines 44-50; col. 3, lines 22-61; col. 4, lines 9-17, the poly-silicon layer 116, taught in Kim, is used as a

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etch mask during the CMP process of the HDP-oxide insulating layer 114 in a similar planarization process, where one of ordinary skill in the art would conclude that the etch mask functions like the claimed reverse mask, and would improve the process in Tsai by enhancing the electrical isolation of the device, as well as the global planarization.

It would have been obvious to one of ordinary skill in the art to incorporate etching a portion of the HDP-oxide film formed on the active region, using at least one gas selected from the group consisting of  $C_xF_y$ ,  $O_2$ , Ar, and  $CH_xF_y$ , in the method of Tsai, pertaining to claim 3, according to the teachings of Kim, with the motivation that, since Kim teaches that forming the insulating layer 114 (HDP-oxide film) in the plasma CVD process having an argon (Ar) gas, includes etching the insulating layer 114 (HDP-oxide film) and since Kim also teaches that the HDP-oxide may be dry-etched subsequently as well (col. 3, lines 59-61), one of ordinary skill in the art concludes that the HDP-oxide may be etched using an argon (Ar) gas for the benefits taught in Kim.

It would have been obvious to one of ordinary skill in the art to incorporate the etch selectivity of the oxide film to the poly-silicon film being greater than 100:1, pertaining to claim 4, in the method of Tsai, based on the combined teachings of Tsai in view of Kim, with the motivation that, both methods are performed under the use of conventional techniques resulting in the selective removal of the HDP-oxide layer to the poly-silicon or underlying film, using dry or wet etching techniques, respectively. In particular, Tsai suggests a high etch selectivity between the two layers (col. 3, lines 24-35; col. 4, lines 1-12). The claimed selectivity of greater than 100:1 is considered to be within conventional specifications, especially since no criticality has been shown.




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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stanetta D. Isaac whose telephone number is 571-272-1671. The examiner can normally be reached on Monday-Friday 9:30am -6:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on 571-272-1679. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Stanetta Isaac  
Patent Examiner  
August 4, 2004

  
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**PRIMARY PATENT EXAMINER**  
**TC 2800, AU 2812**